Programming Basics!

Welcome!

What is programming?

Programming is a way for humans to instruct computers and solve problems.

In robotics, programming is the bridge between strategy and the robot.

How do we code?

We use **programming languages** to tell the computer/robot what to do. We use the **Java** programming language.

Not this Java

This Java

Firstly…

How do you make a PB&J?

Sample PB&J

- Open cabinet and reach out right hand to grab the top plate.
- Place plate on the surface of the table.
- Turn 180 degrees to the refrigerator and open fridge with right hand.
- Once fully open, release handle and reach in to grab peanut butter with left hand and jelly with right hand.
- Back up 2 steps and turn to face table.
- Walk back to table with both jars and place on table next to plate.
- Return to refrigerator and grab loaf of bread with right hand
- Close the fridge with left hand before returning to table.
- Place bread down on table next to jars of PB and J
- etc…

This is called Pseudo-Code

Pseudo-code is just like a procedure! List out the steps in how a human would perform a task BEFORE writing code for it.

Pseudo-code allows us to organize our thoughts on how to approach writing our code.

Once we have our procedure, it’s time to code!

How Does a Robot Remember Something?

Variables are used to store data - like numbers, true/false, or letters.

Variables allow us to assign a name to numbers and letters so they can be referenced in the code.

Variable Types

Commonly used data types are:

int - integers

double - decimals

boolean - true or false

Declaring Variables in Java

[public/private] [type] [name] = [value];

Examples:

- private int length = 5;
- public double price = 17.54;

Let’s try an example!

- Open an online compiler or IDE that allows us to write our code and run the code to see if it works.

Online compiler:

- Compiler

Let's Make our Own Variables!

I am baking a cake for Violet's birthday. Pulling out a secret family cake recipe, I see that I need 5 cups of flour and 3 cups of sugar to make a cake of radius 20.0 cm. Make integer variables for my flour and sugar, and a double variable for the radius of the cake.

Manipulating variables

Variables can be manipulated with operators:

- `*` multiplication
- `/` division
- `+` addition
- `-` subtraction

How Much Cake did I Make?

Using the variables we made before, make a variable that stores the area of the 20.0 cm cake. (Note: use 3.14 for Pi… for now!)

When done, have the compiler print the area using:

System.out.println(yourVariableName);

Where do we see Conditionals?

- Conditionals appear a lot in math
  - Geometry uses conditional logic-
  - Ex: **If** p is true and q is true, the statement is true.
- We also use conditions in real life!
  - Conditionals are ways that we make decisions -
  - Ex: If it is raining outside, I won't go to the beach

How do we use conditionals?

Just as conditionals help us make decisions, they also help computers decide what to do based on a given conditional and controls how your program flows.

Example: I will wear shorts if the temperature is greater than 75 degrees outside.

```
if (degrees > 75) {
    System.out.println("I will wear shorts");
}
```

Print Statements

In our cake code, we used a print statement to display the area of our cake:

```
System.out.println(yourVariableName);
```

This line of code tells the computer to print whatever is in the parentheses. To print sentences, place the sentence in “quotation” marks.

```
System.out.println(“I don’t know how to bake a cake!”);
```

Cake for Everyone!

If everyone in robotics (30 of us) wants a 30 cm^2 slice of the cake, will my 20.0 cm cake be enough for everyone?

Make a conditional that decides if the cake's area is enough for everyone, then print out the answer.

Logical Operators

x == y	“is x equal to y”
x != y	“is x not equal to y”
x > y	“is x greater than y”
x < y	“is x less than y”
x >= y	“is x greater than or equal to y”
x <= y	“is x less than or equal to y”
x && y	“are both x AND y true”
x || y	“is x OR y true”

Let there be Logic!

Everyone has finished their cake and wishes to go to the pool. However, it is 5 o'clock and getting cold. Is the temperature warm enough for a pool party?

Make a variable that stores the current temperature (search online) and time. If the temperature is greater than or equal to 65 OR the time is before 4 o'clock, print out "Pool Party!". Otherwise, print out "No".

Dun Dun Dun… Homework

Find two of your favorite movies, and make variables out of the run times of both movies (in minutes). It is 10 o'clock right now and you plan on sleeping at 2 o'clock (don't actually sleep this late). Do you have enough time to watch BOTH movies? If you do, how much time do you have left before sleeping? Have the compiler print out the name of the movies and all the answers.

*__Note__: Write and test your answers in a compiler before saving it on NotePad and bring it in on a flashdrive.